Two New Species of *Hedyotis* (Rubiaceae: Hedyotideae) from Hainan, China

Rui-Jiang Wang

South China Botanical Garden, Chinese Academy of Sciences, Guangzhou 510650, People's Republic of China. rwang@graduate.hku.hk

ABSTRACT. *Hedyotis cheniana* R. J. Wang and *H. wuzhishanensis* R. J. Wang, from Hainan Province, China, are described as new. *Hedyotis cheniana* is similar to *H. terminaliflora* Merrill & Chun in having a terminal condensed inflorescence, but differs in having elliptic to ovate, or sometimes circular leaves with rounded or truncated leaf bases and distinct petioles, narrowly triangular stipules with a lacerate margin, heterostylous flowers, and short calyx tubes. *Hedyotis wuzhishanensis* is similar to *H. paridifolia* Dunn in having two pairs of leaves that are closely adjacent to the terminal inflorescence, but it can be distinguished by its covering of sparse to dense hairs on all vegetative organs, four to five pairs of secondary veins, and distinct petioles. These two new species belong to *Hedyotis* sect. *Diplophragma* Wight & Arnott based on the dehiscent pattern of their mature capsules.

Key words: China, *Hedyotis*, sect. *Diplophragma*, IUCN Red List, Rubiaceae.

The genus *Hedyotis* L. (s.l.) occurs throughout the tropical and warm subtropical regions of the world. Under a broad generic circumscription, approximately 515 species from Asia and the Americas are included in this large heterogeneous genus (Terrell & Robinson, 2003; Dutta & Deb, 2004). The inflorescence structure of species belonging to this genus varies from paniculate, corymbose, or umbellate to condensed capitate cymes, with usually 4-merous flowers. Capsules range from globose to ovoid or ellipsoid, dehiscing septicidally, loculicidally, or obscurely, or indehiscent. Seeds in *Hedyotis* are minute, angled, and embedded in the central placenta.

Hedyotis, a genus of subfamily Rubioideae (Bremer, 1996), was traditionally placed in the tribe Hedyotideae Chamisso & Schlechtendal ex DC. (Verdcourt, 1958; Bremekamp, 1966; Robbrecht, 1988). Although recent molecular studies (Bremer, 1996; Bremer & Manen, 2000) showed that *Hedyotis* was in the tribe Spermacoceae Berchtold & Presl, here, in the more traditional manner, I treat Hedyotideae as a separate tribe based on the basic differences in the seed and fruit morphology of the two tribes (Terrell et al., 2005). Moreover, there has been confusion over the delimitation of *Hedyotis* L. (s. str.) and *Oldenlandia* L. ever since the two genera were first proposed by Linnaeus in 1753. Lamarck (1791) first combined the two genera and accepted *Hedyotis* as the name of the combined genus, but this generic circumscription was not accepted by other workers, e.g., Bremekamp (1952), Verdcourt (1976), Terrell and Robinson (2003), and Terrell et al. (2005). Paraphyletic (Bremer, 1996; Bremer & Manen, 2000) or polyphyletic (Andersson & Rova, 1999; Andersson et al., 2002) relationships of *Hedyotis* and *Oldenlandia* in molecular studies imply that the name *Hedyotis* has been applied to several related groups (Terrell & Robinson, 2003), and an objective delimitation of this complicated group is still uncertain. The lack of comprehensive taxonomic and phylogenetic study on Chinese *Hedyotis* species suggests that a broad concept of *Hedyotis* be maintained, and two new species are described here.

1. **Hedyotis cheniana** R. J. Wang, sp. nov. TYPE: China. Hainan: Maoan, Mt. Jianling, mtn. area, granite, in valley, dense forest, shady places, 620–920 m, 29 Feb. 1956 (fl), *Investigating team for Hainan Vegetation of the Chinese Academy of Sciences 00797* (holotype, IBSC; isotype, KUN). Figure 1.

Species nova *Hedyotidi terminaliflorae* Merrill & Chun similis, a qua foliis ellipticis, ovatis vel interdum circularibus ad basem rotundis vel truncatis, et distincte petiolatis, stipulis angusto-triangularibus laceratis, floribus heterostylis, tubis calycium brevibus (1–2 mm longis) differt.

Undershrubs, ca. 0.5 m tall, erect, glabrous, branching above; stems terete but a little grooved in young branches. Leaves 1.7–3.8(–5) × 1.6–2.5 cm, elliptic to ovate, sometimes circular, obtuse, acute or mucronate at apex, rounded or truncate at base, coriaceous, glabrous; secondary veins in 3 or 4 pairs, obscure adaxially, prominent abaxially; petiole slender, 2.5–5(–9.7) mm; stipules 2–3.5 × ca. 1.8 mm, narrowly triangular, pinnately lacerate, coriaceous, glabrous. Inflorescence terminal, subcapitate, with 10

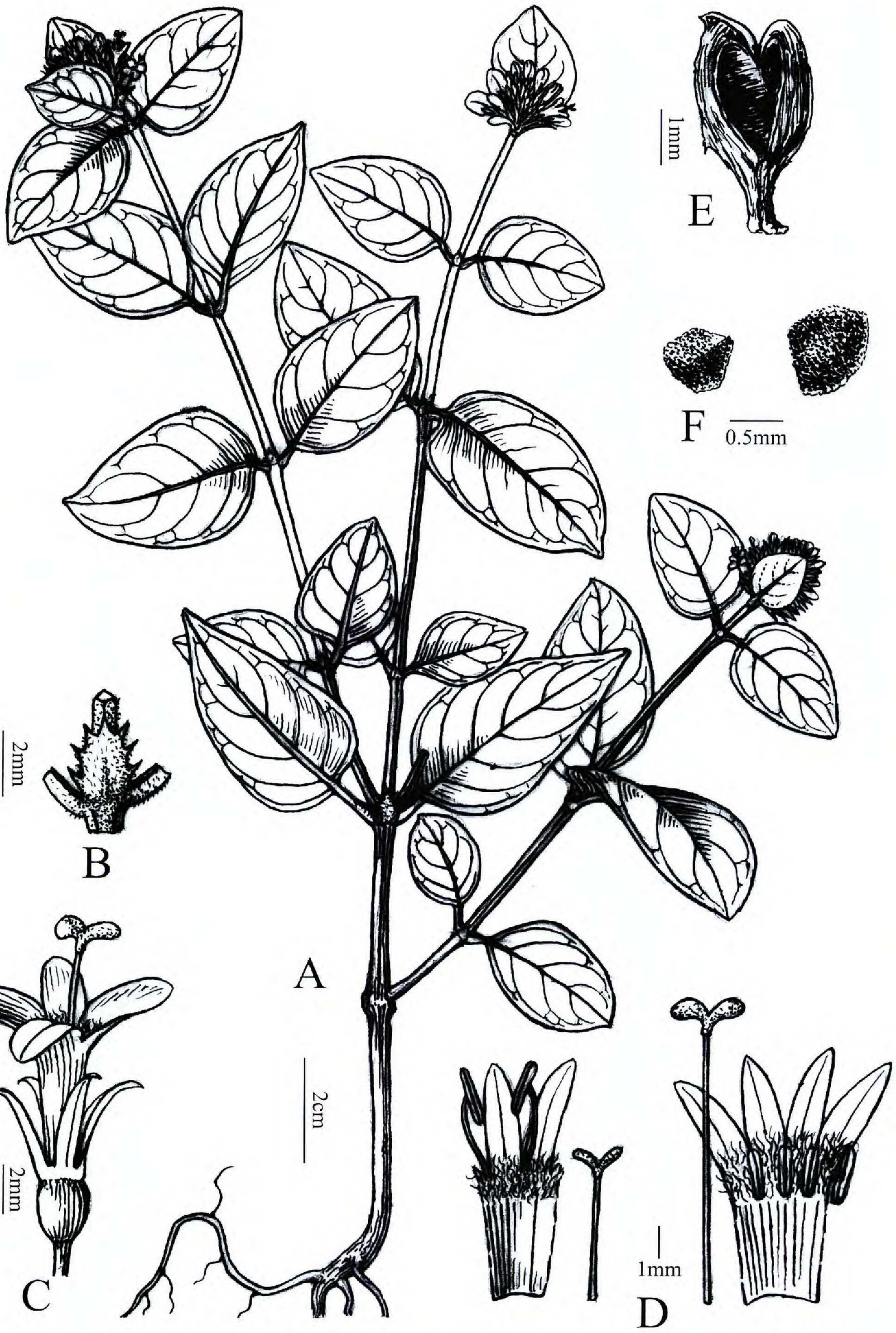

Figure 1. *Hedyotis cheniana* R. J. Wang. —A. Habit. —B. Stipule. —C. Long-styled flower. —D. Corolla and style (left: short-styled, right: long-styled). —E. Capsule coccus. —F. Seeds (left: adaxial view, right: abaxial view). Drawn from the holotype, *Investigating team for Hainan Vegetation of the Chinese Academy of Sciences 00797* (IBSC).

to 30 flowers per cyme, 1–2 cm diam., peduncles short, 2–3 mm. Flowers 7.5–9 mm, heterostylous, pedicels ca. 2 mm; calyx tube ca. 1–2 mm, lobes 4, ca. 4 mm, lanceolate, apex acuminate; corolla cylindric, white, tube ca. 5 mm, pubescent at throat, lobes 4, ca. 2 mm, oblong to lanceolate; stamens 4, adnate to the pubescent throat of corolla tube, anthers 1–1.5 mm, oblong-linear; stigma bilobed, papillate;

long-styled flowers, with stamens included, filaments ca. 1 mm, styles ca. 10 mm, exserted; short-styled flowers, with stamens exserted, filaments ca. 2 mm, styles ca. 5.5 mm, included. Capsule globose, ca. 2 mm diam., with persistent calyx limbs, ca. 4 mm, glabrous, dehiscing partially loculicidal at apex and then completely septicidal; seeds 6 to 10, angular, ca. 0.8 mm, testa reticulate, black.

Distribution and ecology. All known collections occur in Hainan Province, China. The plants were growing in dense forest, on summits, or on slopes or valleys, in scattered, rich soil or granite sites, at altitudes from 620–960 m.

IUCN Red List category. *Hedyotis cheniana* is mainly distributed in central Hainan Island and can grow in various habitats. Although no herbarium specimen of this species has been collected after 1959, I assess it as Least Concern (LC) according to IUCN Red list criteria (IUCN, 2001), because of its extensive distribution and the protected habitat in the areas in which it was collected.

Phenology. Collected in flower from January to February and in fruit from June to November.

Etymology. *Hedyotis cheniana* is named in honor of the Chinese collector Shao-Qing Chen (IBSC).

Relationships. The new species belongs to *Hedyotis* sect. *Diplophragma* Wight & Arnott because its globose capsule dehisces loculicidally initially at the apex, then septicidally below. Its condensed subcapitate terminal inflorescences resemble those of *H. terminaliflora*, but the new species can be distinguished by its elliptic to ovate leaves with a rounded to truncate leaf base and distinct petiole (vs. lanceolate to oblong-lanceolate leaves with an acute to subacute leaf base and 1–2 mm petiole in *H. terminaliflora*), the lacerate, narrowly triangular stipule (vs. integrated and ovate stipule in *H. terminaliflora*), the heterostylous flowers, and short calyx tubes (vs. 3 mm long in *H. terminaliflora*).

Paratypes. CHINA. **Hainan:** Mt. Jianling, 29 Feb. 1956, *Investigating team for Hainan Vegetation of the Chinese Academy of Sciences 00795* (IBSC, KUN); Mt. Jianling, 9 Nov. 1959, *Sino-Germany collection team 1964* (IBSC, MO); Baoting, 21 Feb. 1957, *L. Tang* (*Liang Deng*) *3782* (IBSC, MO); Ledong Co., Mt. Chang-E-Ling, 25 June 1936, *Xin-Qi Liu 27267* (IBSC, KUN); Lingshui Co., on rd. from Tongjia to Wenhua, 13 Jan. 1934, *Xiang-Ri Liang 64656* (IBSC).

2. Hedyotis wuzhishanensis R. J. Wang, sp. nov. TYPE: China. Hainan: Ding'an Co., Mt. Wuzhishan (Mt. Five-finger), riverside, 19 Dec. 1933 (fl, fr), *Zhi Huang 35636* (holotype, IBSC; isotype, MO). Figure 2.

Species nova *Hedyotidi paridiflorae* Dunn similis, a qua caulibus, foliis, petiolis, stipulis, sepalisque pubescentibus, venis secundariis in 4 vel 5 paribus dispositis, petiolis 3.8–5.7(–10) mm longis differt.

Shrubs to subshrubs, ca. 0.5–1 m tall, erect, diffuse, pubescent; stems terete, densely pubescent on young leaflets and then gradually sparser; internodes usually 1.8–4.9(–8) cm but ca. 2 mm acropetally. Leaves (2.5–) 3.4–5.5(–6.2) × 1.4–2.8(–3.3) cm, elliptic or ovate, sparsely pubescent on both sides, with dense pubescence along the midrib and veins, acute at apex, rounded to subrounded at base, papyraceous; secondary veins in 4 to 5 pairs; petiole 3.8–5.7(–10) mm, densely pubescent; stipules ca. 2.5 mm, triangular with acuminate apex, pubescent. Inflorescence terminal or in upper leaf axils, cymes, 0.7–1.7 cm diam., subtended by 4 leaves at the 2 uppermost reduced internodes. Flowers (2)6 to 15 per inflorescence, 8.5–10 mm, sessile to subsessile; calyx tube ca. 1.8 mm, lobes 4, 2.5–3 mm, lanceolate, apex acuminate, pubescent; corolla funnelform, white, tube 5.5–6.5 mm, pubescent adaxially, lobes 4, ca. 2.5 mm, oblong to lanceolate, pubescent abaxially; stamens 4, exserted, filaments 1–2 mm, adnate to the throat of corolla tube, anthers oblong-linear, 1.5–2 mm; styles ca. 5 mm, stigma bilobed, lobes 1–2 mm, linear, papillate. Capsule ovoid, ca. 3 × 2.5 mm, appearing 4.5–7.5 mm long including persistent calyx limbs, densely pubescent, dehiscing loculicidally at the apex initially, then proceeding septicidally when mature; seeds ca. 15, angular, ca. 0.5 mm long, testa reticulate, black.

Distribution and ecology. *Hedyotis wuzhishanensis* was found on Mt. Wuzhishan and one of its branches, Mt. Limuling. The plants usually grow on mountain summits, valleys, or near rivers, in forest, at altitudes from 600–1540 m.

IUCN Red List category. *Hedyotis wuzhishanensis* is endemic to Mt. Wuzhishan. Because of the poor and limited collection in this area, the five specimens examined were collected from 1933 to 1989. However, the species can grow in various habitats and may distribute extensively on many branches of Mt. Wuzhishan, which is protected as a nature reserve. I therefore assess the status of this species as Least Concern (LC) according to IUCN Red List criteria (IUCN, 2001).

Phenology. Collected in flower and fruit from October to December.

Relationships. The new species belongs to *Hedyotis* sect. *Diplophragma* because its ovoid capsules

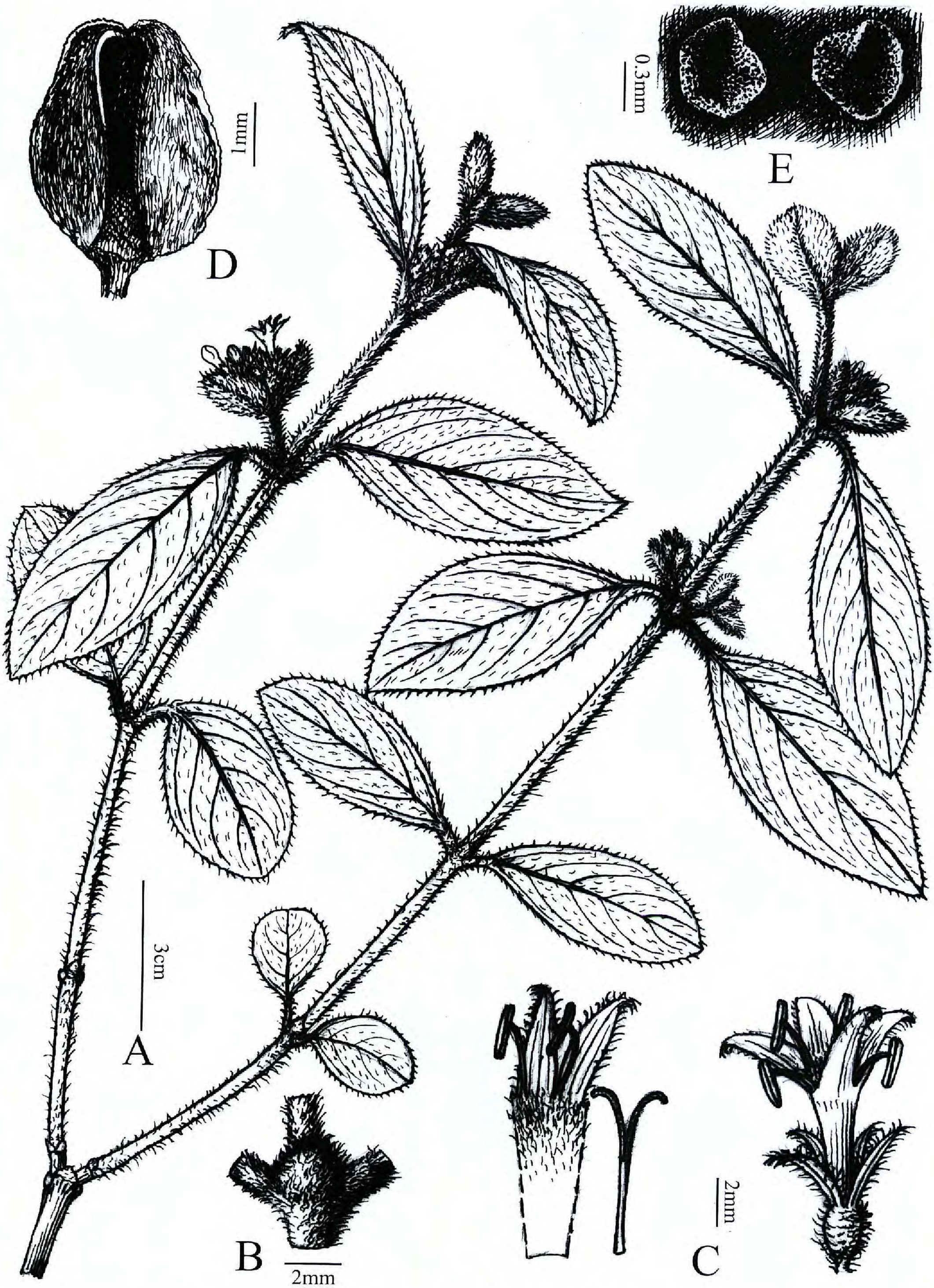

Figure 2. *Hedyotis wuzhishanensis* R. J. Wang. —A. Habit. —B. Stipule. —C. Flower (left: adaxial view, right: flower with calyx). —D. Capsule coccus. —E. Seeds (left: adaxial view, right: lateral view). Drawn from the holotype, *Zhi Huang 35636* (IBSC).

dehisce loculicidally first at the apex and then septicidally as the capsules develop. It is close to *H. paridifolia* in having the inflorescences terminal or in upper leaf axils, which are partly hidden within the subtended leaf bases, but the new species can be easily distinguished by having an obvious indument on the stem, leaf lamina and petiole, stipules, and sepals (vs. glabrous in *H. paridifolia*), four to five pairs

of secondary veins (vs. five to seven pairs in *H. paridifolia*), and petioles 3.8–5.7(–10) mm long (vs. 0–0.5 mm in *H. paridifolia*).

Hedyotis paridifolia, which was wrongly assigned to *Hedyotis* sect. *Hedyotis* by Ko (1999), should belong to *Hedyotis* sect. *Diplophragma*, because my careful examination of a specimen of *H. paridifolia* (*Xing-Ri Liang 63279*, IBSC) showed that its mature capsules dehisced septicidally, rather than indehiscent capsules. Therefore *H. paridifolia* was used to compare with *H. wuzhishanensis* in the diagnosis here.

Paratypes. CHINA. **Hainan:** Mt. Wuzhishan, 26 Oct. 1989, *Guo-Ai Fu 6736* (IBSC), 17 Dec. 1933, *Zhi Huang 35521* (IBSC), 7 Nov. 1954, *Hainan East Team 574* (IBSC); Mt. Limuling, 17 Oct. 1956, *Shao-Qing Chen 10662* (IBSC).

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